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FOREST RESOURCES OF NORTH CENTRAL ALABAMA

By

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A Progress Report by

THE SOUTHERN FOREST SURVEY

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FOREWORD

The Nation-wide Forest Survey, being conducted by the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928. Its five-fold object is: (1) To make an inventory of the present supply of timber and other forest products; (2) to ascertain the rate at which this supply is being increased through growth; (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease; (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products; and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of land suitable for forest production.

This release is based on a field survey made June 29, 1935 to October 5, 1935 and on two field canvasses of forest industrial plants to determine forest drain, the last of which was completed during May 1937. It should be regarded as a progress report only, since it contains Forest Survey data that will be included in complete reports to be published later; such data, although considered reliable, are subject to correction or amplification as the work of computation proceeds. Item 4 above, which is being studied on a national basis, is not discussed in this report.

In the presentation of these survey data, it should be noted that owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Hence classes that are of infrequent occurrence and relatively small in quantity generally cannot be determined with as high a degree of accuracy as classes that occur more frequently and in substantially greater quantities. Small tabular items are to be taken as showing, not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey functions as an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff

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FOREST RESOURCES OF NORTH CENTRAL ALABAMA

General Description

The area in north central Alabama designated as Survey Unit No. 5 (fig. 1) includes 6.6 million acres, contained in 15 counties. It embraces a large part of the Appalachian Highlands in Alabama, which occur as a series of mountains and low ridges running northeast and southwest, separated by valleys of varying widths. The rich deposits of coal, iron ore, marble, and other minerals that underlie much of the area make the section around Birmingham one of the Nation's important coal and iron districts. Since fertile soil is found in the valleys and on some of the plateaus, agricultural use of the land is important and widespread, but does not compare in extent with that used for timber production. The forest resource occupies 4 million acres of forest land and comprises more than 8 billion board feet of timber.

Topographically[1/] the area is made up of three main physical divisions: The Piedmont Upland, the Valley and Ridge Province, and the Cumberland Plateau. The Piedmont Upland is represented by the Ashland Plateau, the mountainous portion of the Piedmont. Elevations range from 2,407 feet on Cheaha Mountain, the highest point in the State, to 500 feet along the Coosa River.

The Valley and Ridge Province includes the Weisner Ridges, Coosa Valley, Coosa Ridges, Cahaba Valley, Cahaba Ridges, and the Birmingham-Big Canoe Valley (fig. 1). The Weisner Ridges, which are the highest, have a maximum elevation of 2,130 feet. The Coosa Valley is about 100 miles long and has a maximum width of 20 miles, whereas the other two valleys are somewhat shorter and are less than 10 miles wide.

The Cumberland Plateau contains the southwest extremities of Lookout Mountain, Wills Valley, Sand Mountain, and Sequatchie Valley. Blount Mountain, a branch of Sand Mountain, is entirely within this area, as is Murphee Valley. As a rule the valleys are about 5 miles wide. The mountains, which are flat-topped with precipitous sides, are about 1,000 to 1,500 feet high. The Warrior Basin, a plateau sloping from about 1,000 feet at its northern edge to about 500 feet at the southwestern boundary of the unit, makes up by far the largest part of the plateau.

There are more than 50 soil series in this area; these are divided into a number of soil types that basically are clay, silt, sandy, gravelly, and stony loams. In the Piedmont Upland the soils were derived through the weathering of underlying crystalline rocks. The Louisa and Cecil soils, which are the most extensive and erode severely, occur over wide areas in Randolph, Clay, Coosa, and Cleburne counties and occupy about 13 percent of the unit area. The loams and sandy loams are the best for agriculture.

The soils of the Valley and Ridge Province and of the Cumberland Plateau are the result of the decomposition of sandstones, shales, and limestones. The Dekalb series, which is most common and occupies nearly a third of the unit area, is widespread in Jefferson, Cullman, Blount, and Walker counties. Other common

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1/ Data for these three paragraphs and figure 1 are taken from "Physical divisions of northern Alabama," Geological Survey of Alabama. Bull. No. 38. Univ. Ala., 1930.

soils are those of the Hanceville and Talladega series, which together occupy about 11 percent of the unit area; large areas of one or the other of these soils are found in Cleburne, Walker, and St. Clair counties. Ten percent of the total land area is classified as rock outcrops, or as rough stony land. In general, agricultural crops are found on the more fertile soils, but forest stands occur on all soil types.

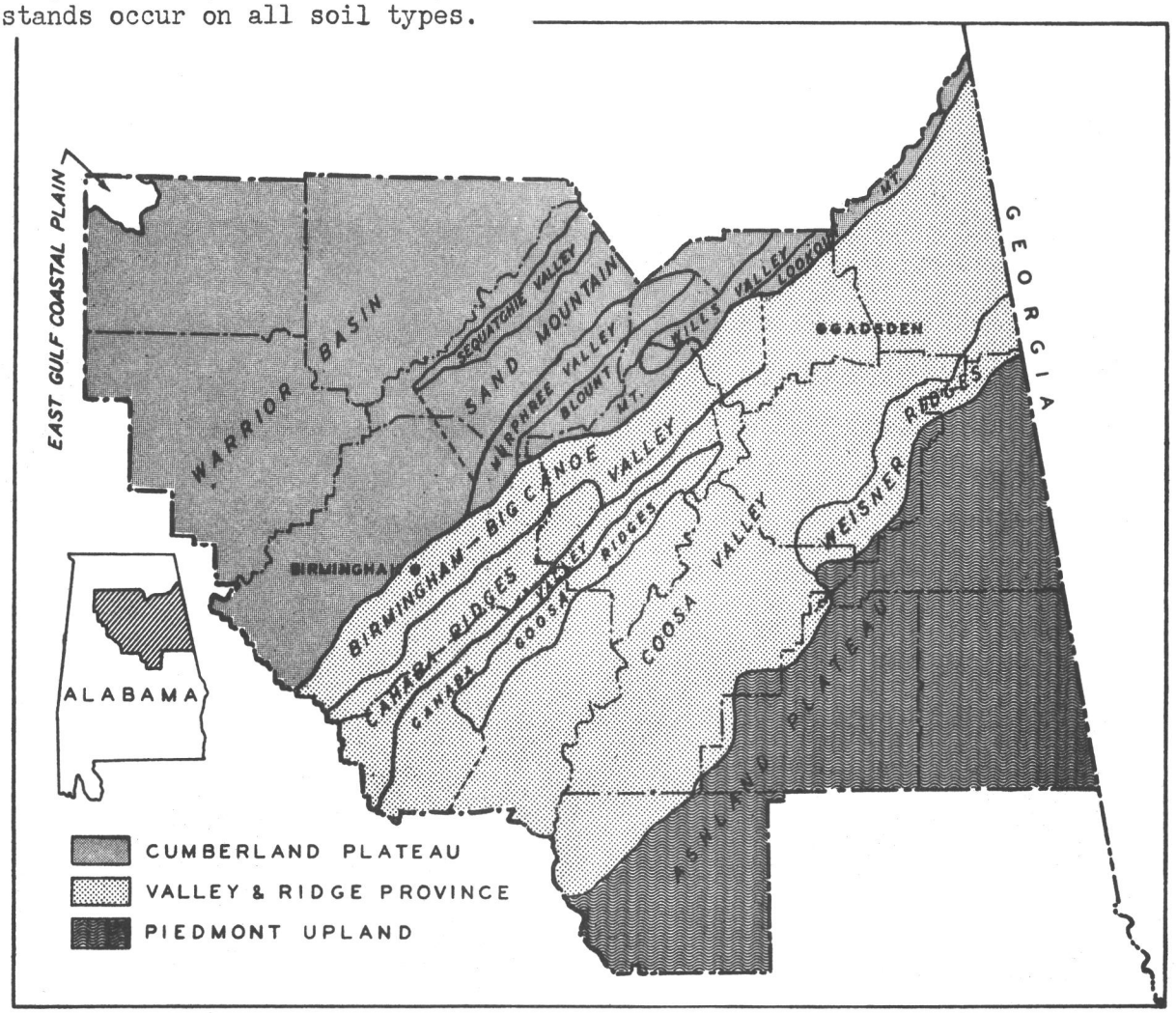


FIGURE 1. **– PHYSICAL DIVISIONS OF ALABAMA UNIT NO. 5.**

The area is drained by the Black Warrior, Cahaba, Coosa, and Tallapoosa rivers, which flow southwestward to combine their waters with larger streams that empty into the Gulf of Mexico at Mobile. There are many small streams in the watersheds of these four main rivers, and the abundant rainfall, along with the steep slopes and the erodible soils, makes flood control a major problem.

Erosion is serious throughout the unit. Practically the entire area is subject to moderate or severe sheet erosion with occasional gully formation. Most of the severe erosion is in the Coosa Valley and on the Ashland Plateau. Moderate erosion is most common in the Warrior Basin, but large areas of severely eroded land also occur here.[2/] The type and degree of erosion classified according to land use is presented in table 1. These data are based upon

2/ Reconnaissance erosion survey, Soil Conservation Service, 1934.

a field classification by the Forest Survey. Sheet and shoestring erosion were most common in cultivated and in idle and abandoned agricultural lands, while pasture lands showed the highest proportion of gully erosion. Sheet erosion is the most common type on the forested lands, which are least subject to erosion.

Table 1.—Correlation of land use with erosion

Land use	Type of erosion				Total
	Sheet	Shoestring	Gully	None or arrested	
	Percent				
Forest	8.7	2.7	1.8	86.8	100.0
Pasture	11.9	5.4	5.9	76.8	100.0
Cropland:					
In cultivation	20.1	6.5	0.9	72.5	100.0
Idle and abandoned	21.7	15.8	4.5	58.0	100.0
All land-use classes	12.8	4.6	1.7	80.9	100.0

At least nine main railroad systems operate within this area, as well as numerous secondary railroads. Since Birmingham is the largest industrial city, it is the focal point for most of the important lines, including the Southern and the Louisville & Nashville, which have the most extensive trackage. In Blount, Clay, Cleburne, Cullman, Coosa, Randolph, and Winston counties, however, large areas are almost devoid of rail transportation, whereas the more industrialized counties, such as Jefferson and those in the Coosa Valley, are served by a veritable network of railroads.

Water traffic from Cordova in Walker County to Mobile is by way of the Mulberry Fork, Black Warrior, and Tombigbee rivers. An 8-foot channel is maintained for all-year traffic over this 500-mile watercourse. At Port Birmingham a railroad operated by the Warrior River Terminal Co. carries waterborne freight to the Birmingham district. Crossing the unit are four paved federal highways, three of which intersect at Birmingham, so that paved roads radiate like the spokes of a wheel to the surrounding territory. The interconnecting roads are chiefly gravel and reasonably numerous.

The population has steadily increased since 1870. In the three decades between 1870 and 1900, there was a threefold increase; between 1900 and 1930 the population doubled. According to the Bureau of the Census, the population in 1930 was 882,000. Forty-five percent lived in cities, 24 percent in towns or settlements of less than 2,500 inhabitants, and 31 percent on farms. Three-fourths of the urban population in 1930 was in Jefferson County, in which Birmingham (1930 pop. 260,000) and Bessemer (1930 pop. 21,000) are located. Negroes made up 28 percent of the total population in 1930, and about two-thirds of them lived in the Birmingham district.

Of the 330,000 gainfully employed workers in the unit enumerated by the 1930 census, 26 percent were engaged in agriculture, 19 percent in mining and the steel industries, 4 percent in textile mills, 2 percent in the wood-using industries, and the remainder in miscellaneous manufacturing and service industries. In 1937 the Unemployment Census found that 103,200 persons were totally or partially unemployed. More than half of these lived in Birmingham and the surrounding county. Sixteen percent of the total needing employment were farmers and farm laborers, 18 percent were other laborers, and 30 percent were skilled and semiskilled workers. In 1937 there was a large surplus of skilled and semiskilled workers in the Birmingham industrial area, as nearly 17,000 needed more employment. Improved conditions in the steel and coal industries undoubtedly would take up much of this slack.

The major industrial development in this area is the manufacture of iron and steel and their products. Blast furnaces and rolling mills have centered around the iron, coal, and limestone deposits of the Birmingham district, and at Gadsden and Alabama City. Plants at Anniston and Birmingham manufacture a large part of the cast iron pipe produced in the United States. The Census of Manufactures, taken in 1935, lists 56 plants in Alabama making iron and steel products. These plants, practically all of which are in this unit, employed 17,000 men in 1934 and manufactured products valued at about 68 million dollars.

Alabama produces more coal than any other state in the South, most of which comes from fields within this unit. The most important coal basin is the Warrior, which includes parts of Jefferson, Walker, Blount, Cullman, and Winston counties, as well as several counties outside the unit. The Cahaba coal basin, which is second in importance, occupies parts of St. Clair, Jefferson, and Shelby counties. The Coosa coal basin, also in St. Clair and Shelby counties, has large reserves that are relatively undeveloped. In these three coal basins, which underlie approximately one-fifth of all the land in the unit, $8\frac{1}{2}$ million tons of coal were mined in 1934 by 16,000 mine workers. About $7\frac{1}{4}$ million tons of this total were mined in Jefferson and Walker counties.

The development of the modern textile industry dates from 1880. The passage of legislation in 1893 authorizing counties to extend tax-exemption privileges gave the textile industry a further impetus, and by 1935 the census listed 81 plants in the State as cotton or cordage manufacturers. In 1934, these plants employed 33,000 people, and their product was valued at 89 million dollars. Forty-eight of these textile plants were located in this unit in 1936, operating about 17,000 looms and 700,000 spindles, and giving employment to approximately 20,000 wage earners.

The Bureau of the Census reported that in 1935 there were 59,000 farms in this unit, containing 3,960,000 acres of land. In 1934, crops were harvested from 34 percent of this acreage, forests and woodland pastures occupied 48 percent, and 18 percent was used for other purposes. The 1,891,000 acres of farm woodlands constitute 47 percent of all the forest land. Tenants occupied 55 percent of the number of farms in 1934, but only 16 percent of the 32,000 tenants have stayed upon the same land for as long as 5 years, with the result that there has been constant soil deterioration through failure to complete soil-building crop rotation. A frost-free growing season of about 200 days, aided by an average rainfall of 53 inches, favors the production of

general crops such as corn, cotton, oats, wheat, hay, potatoes, and vegetables. Between 1929 and 1934 there was a great increase in the production of forage crops for livestock and in foodstuffs for human consumption; the increased acreage of corn alone exceeded the acreage reduction in cotton.

The number of farms increased by 8,500 between 1929 and 1934; this was caused largely by miners and other industrial workers moving to small farms as employment was curtailed during the depression. In Jefferson County, for example, the number of farms increased 94 percent, while the average size of farm decreased from 53 to 31 acres. Many of the farms (table 2) are too small to support a family adequately, and part-time employment is needed to supplement the farm income. Data gathered by the census showed that farmers worked more than 1,700,000 man-days away from their farms in 1934, an average of 29 days per farmer.

Table 2.—Number and acreage of farms, classified according to size, 1935 (data from Census of Agriculture)

Size in acres	Number of farms	Proportion of total number	Total land in farms	Proportion of total acreage
		Percent	Acres	Percent
Less than 50	32,566	55.1	817,352	20.6
50 - 99	15,094	25.5	1,062,754	26.9
100 - 499	11,179	18.9	1,826,512	46.2
500 - 999	232	.4	148,207	3.7
1,000 and over	61	.1	104,844	2.6
Total	59,132	100.0	3,959,669	100.0

The Bureau of Agricultural Economics of the United States Department of Agriculture cooperating with the Works Progress Administration in Alabama, made an intensive study of rural-land ownership in 1935. Information was compiled for each county in the unit, and 44,100 ownerships, containing 5,827,800 acres, were recorded. In table 3 the number and acreages of these ownerships are classified according to size. It is obvious that a great number of people own small parcels of land, as almost 41,000 owners (92 percent of the total) together control only half the acreage. Good land-use practices probably would be promoted most effectively through extension, if present efforts to further the program were concentrated upon the larger owners (8 percent of the total) who possess the other half of the rural land.

Seventy-four percent of the land was owned by persons living within the county where the land was situated and 11 percent by persons residing in adjoining counties. About 6 percent was owned by persons living elsewhere in Alabama, 4 percent by out-of-state owners, 4 percent by public agencies, and 1 percent by owners whose addresses were unknown.

Table 3.--Number and acreage of rural ownerships, classified according to size, 1935

Size in acres	Number of owners	Proportion of total number	Total land	Proportion of total acreage
		Percent	Acres	Percent
Less than 50	19,539	44.3	535,876	9.2
50 - 99	10,735	24.3	797,019	13.7
100 - 259	10,349	23.5	1,591,998	27.3
260 - 499	2,203	5.0	761,270	13.1
500 - 999	858	1.9	569,929	9.8
1000 and over	446	1.0	1,571,703	26.9
Total	44,130	100.0	5,827,795	100.0

Over 58 percent of the land is being lived upon and operated by farm owners. Mining companies own 9 percent, while wood-using industries own only 3 percent. The percentage of the land area owned by various business groups is as follows:

Business group	Percent of area owned	Business group	Percent of area owned
Farm owner-operators	58.5	Wood-using industries	3.0
Merchants	3.4	Mining companies	9.2
Professional men	2.4	Power, railroad, and farming companies	1.1
Administrators and executors	2.0	All other businesses	5.2
Banks and mortgage companies	2.7	Governmental agencies	3.8
Real estate agencies	3.9	Unknown	4.8

The forest land is controlled by a large number and variety of owners. The largest proportion (1,891,000 acres) is in small scattered tracts on thousands of farms. Private industrial and investment companies own about 1,780,000 acres. Some of this acreage is held by lumber companies, but the major part of the land in this category is held by coal and iron companies and by land speculators. Most of the 369,000 acres in public ownership is in the Black Warrior and Talladega National Forests.

The general property tax is relatively low as compared with that in other southern states. The Alabama Constitution fixes the maximum ad valorem levy for State, county, and school purposes at 21 mills on an assessed valuation not exceeding 60 percent of the market value. The State share is restricted to a 6½-mill maximum, of which 3 mills are for special school purposes. The counties levy additional school district taxes, but they are a part of the 21-mill maximum. Lands are assessed by the owners at average values with no separate assessments for the improved, unimproved, or timbered acreage, although

their approximate extent is indicated. Forest lands, which are classified as wild or unimproved, are assessed generally at $1.50 to $2.50 per acre, although assessments on heavily timbered stands may be higher. The total tax per acre ranges from 3 cents upward, depending upon assessed valuation, but it averages about 5 cents. A severance tax of several cents per ton is levied upon the coal and iron ore, in addition to the general property tax on the coal lands. Reasonable taxes, along with strict enforcement of tax laws, have prevented excessive tax default. The area on which taxes were unpaid for 3 or more years, as of August 1934, was only 45,000 acres,[3/] or 0.7 percent of the area.

The surface use of 61 percent of the land is for timber production (table 4). The forest land owned by mining companies and land speculators is in large blocks, but almost half of the total forest area is held in small tracts on farms. Idle and abandoned agricultural land greatly exceeds new cropland in extent, and it is probable that this relation will continue, leading eventually to an increased acreage of forest land.

Table 4.—Land area classified according to land use, 1936

Land use	Area	Proportion of total area
	Acres	Percent
Forest:		
Productive	4,035,800	61.0
Nonproductive	4,100	.1
Total forest	4,039,900	61.1
Agricultural:		
In cultivation:		
Old cropland	1,889,000	28.6
New cropland	36,200	.5
Out of cultivation:		
Idle	215,900	3.3
Abandoned	114,500	1.7
Pasture	138,400	2.1
Total agricultural	2,394,000	36.2
Other nonforest	181,100	2.7
Total nonforest	2,575,100	38.9
All land-use classes	6,615,000	100.0

3/ The extent of tax default in the Gulf States in 1934. Occasional Paper No. 49, Southern Forest Expt. Sta., August 25, 1935.

Description of the Forest

Forest stands occupy a vast area (4,035,800 acres) throughout the unit. Most of the forests are on land that has always been timbered, but some stands occur in abandoned fields that have restocked naturally. Almost all (88 percent) of the forested land is stocked with second-growth timber, much of which is below sawlog size. Based on cubic volume, the forest is two-thirds pine and one-third hardwoods, loblolly pine being the most abundant single species, followed closely by shortleaf pine. Based on acreage, half the forest is predominantly pine (table 6). Hardwoods are generally present, even in "pure" pine stands, and in the mixed pine-hardwood forest (27 percent of the total), they make up a considerable part of the volume. The most common hardwoods are red oaks, hickories, white oaks, redgum,4/ yellowpoplar, and blackgum.

Longleaf pine occurs on the tops of some of the ridges and occasionally in isolated patches elsewhere (fig. 2). Originally it covered a much larger area, but as it was logged off it was often replaced by loblolly or shortleaf pines. Longleaf pine grows naturally in pure stands, some of which occur in this area. More usual on the cut-over lands, however, is the occurrence of scattered longleaf pine trees in stands of shortleaf or loblolly pines mixed with hardwoods. In many places, the pines give way to upland hardwoods, and although these areas are not large enough to be indicated in figure 2, in the aggregate they occupy 20 percent of the total forest area.

Along the streams are found the bottomland hardwoods, which consist chiefly of redgum and blackgum, water oaks, yellowpoplar, elms, American beech, hickory, and maple. As a rule the bottomland hardwoods are of much higher quality than the upland hardwoods. Since they occur on the more fertile alluvial soils, most of them have been cleared off, and at present they occupy less than 3 percent of the forested land.

4/ The common name recently accepted by the Forest Service for Liquidambar styraciflua is sweetgum.

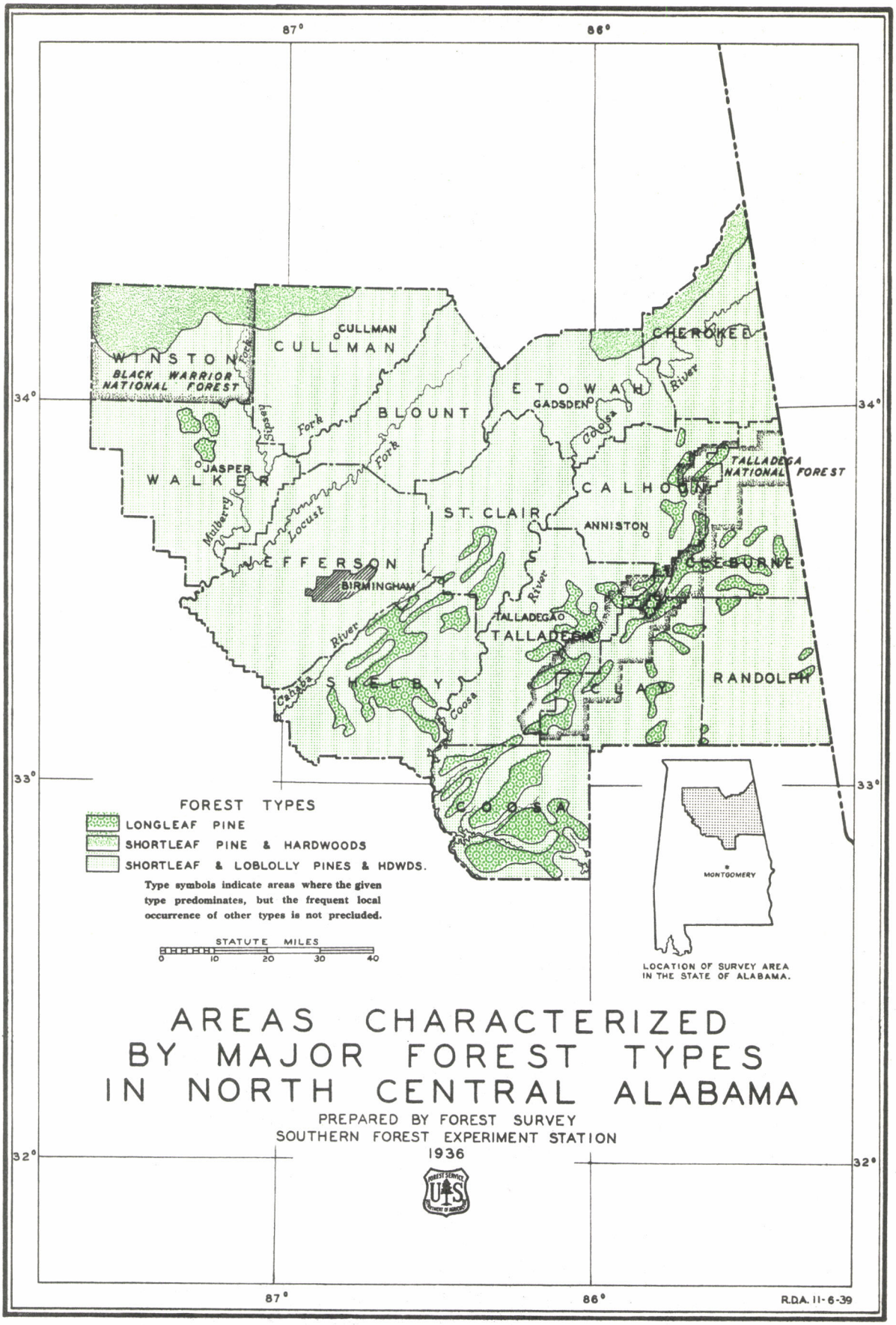


FIGURE 2. - FOREST TYPE MAP

The relative abundance of the various species in the pine, pine-hardwood, upland hardwood, and bottomland hardwood type groups[5/] is given in table 5, in which the net cubic volume of each species in the type group is expressed as a percentage of the volume in the type group.

Table 5.—Species composition of the forest type groups, showing proportion of net cubic volume[1/] in various species

Species	Forest type groups				All type groups
	Pine	Pine-hardwoods	Upland hardwoods	Bottomland hardwoods	
	Percent				
Pines:					
Loblolly pine	38.4	22.9	3.1	4.6	29.3
Shortleaf pine	29.0	20.0	3.8	-	22.9
Longleaf pine	14.7	5.5	1.3	-	10.5
Virginia pine	4.7	2.6	0.6	negl.	3.6
Other pine and cedar	0.6	0.2	0.3	-	0.4
Total	87.4	51.2	9.1	4.6	66.7
Soft-textured hardwoods:					
Yellowpoplar	0.5	3.6	8.5	7.5	2.4
Redgum	0.9	4.5	5.0	24.7	2.9
Blackgum	0.6	2.1	3.2	9.0	1.5
Red maple, willow, sweetbay, etc.	0.1	1.2	2.4	9.3	0.9
Total	2.1	11.4	19.1	50.5	7.7
Firm-textured hardwoods:					
Red oaks	3.0	11.6	21.1	18.1	7.8
Forked-leaf white oak	1.2	5.4	8.7	3.8	3.2
Chestnut oak	0.6	2.0	6.7	-	1.7
Other white oaks	1.7	4.7	5.7	3.5	2.9
Scrub oaks	0.7	1.3	2.1	-	1.0
Hickories	2.9	10.3	22.0	4.5	7.1
Dogwood and persimmon	0.1	0.2	0.6	0.3	0.2
Elms, ash, beech, etc.	0.3	1.9	4.9	14.7	1.7
Total	10.5	37.4	71.8	44.9	25.6
All species	100.0	100.0	100.0	100.0	100.0

1/ Includes bark.

Old-growth timber, which makes up only a small part (11 percent) of the total forest area (table 6), occurs in scattered tracts, often in small clumps. More than half of it has been partly cut over for selected trees or for specialized products. Most of it is in the pine stands; it is very rare in the bottomland hardwoods. Old-growth uncut stands in the pine type group average 7,500 board feet (lumber tally) per acre, in the pine-hardwoods 4,600 board feet, in the upland hardwoods 3,700, and in the bottomland hardwoods 5,400.

5/ See appendix for types included in each type group.

Table 6.—Forest area classified according to forest condition and forest type group, 1936

Forest condition	Pine	Pine-hardwoods	Upland hardwoods	Bottomland hardwoods	All type groups	Proportion of total
			Acres			Percent
Old growth:						
Uncut	89,800	30,500	50,300	6,500	177,100	4.4
Partly cut	121,100	57,600	89,800	7,500	276,000	6.8
Total	210,900	88,100	140,100	14,000	453,100	11.2
Second growth:						
Sawlog size:						
Uncut	890,500	279,300	106,200	28,100	1,304,100	32.4
Partly cut	318,000	124,400	51,100	18,900	512,400	12.7
Under sawlog size	533,000	584,800	452,300	37,900	1,608,000	39.8
Reproduction	51,100	33,800	53,500	4,100	142,500	3.5
Total	1,792,600	1,022,300	663,100	89,000	3,567,000	88.4
Clear-cut	13,200	900	800	800	15,700	0.4
All forest conditions	2,016,700	1,111,300	804,000	103,800	4,035,800	100.0
Percent of total forest area	50.0	27.5	19.9	2.6	100.0	

Second-growth stands, which form most of the forest cover, occupy $3\frac{1}{2}$ million acres of forest land. The areas of sawlog and under-sawlog-size stands are approximately equal for the second-growth forest as a whole, but about two-thirds of the pine stands are of sawlog size. Uncut second-growth sawlog-size stands average 3,900 board feet (lumber tally) per acre in the pine type group, 2,900 in the pine-hardwoods, 2,000 in the upland hardwoods, and 3,900 in the bottomland hardwoods.

The relative productivity of the forest land is indicated by the height in feet attained by average dominant trees at 50 years, a measure that is known as the site index. Determinations of the site index were made throughout the pine types, and it was found that the pine sites of this unit are lower than the average of the State. This is apparent in figure 3, which shows that 57 percent of the loblolly pine area in the State has at least an 80-foot site compared with only 36 percent of the area in this unit. An 80-foot site is considered above average throughout the South.

The distribution of the total number of trees by size-classes is shown in figure 4. It is seen that there is a scarcity of trees over 14 inches d.b.h. and a great abundance of smaller trees, which undoubtedly will soon grow into larger ones—a circumstance that has a direct and favorable bearing

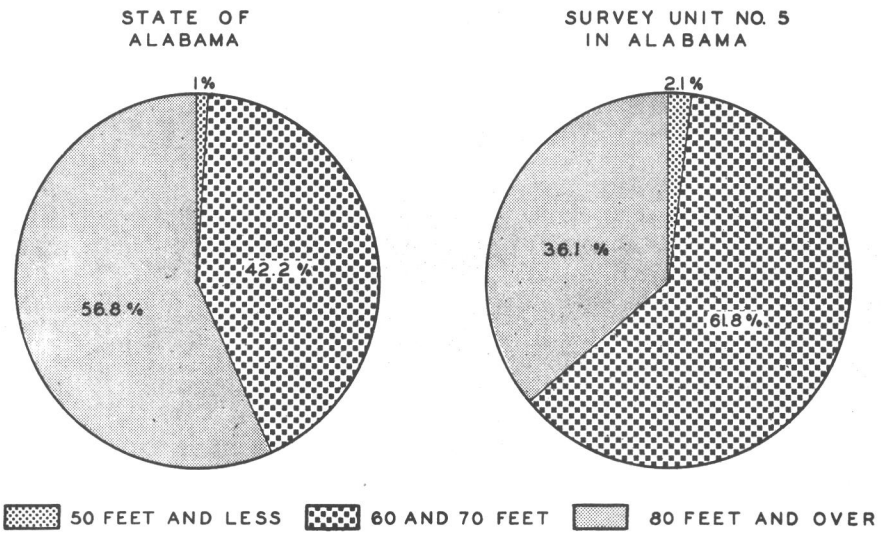


FIGURE 3.— PERCENTAGE OF LOBLOLLY PINE AREA IN VARIOUS SITES.

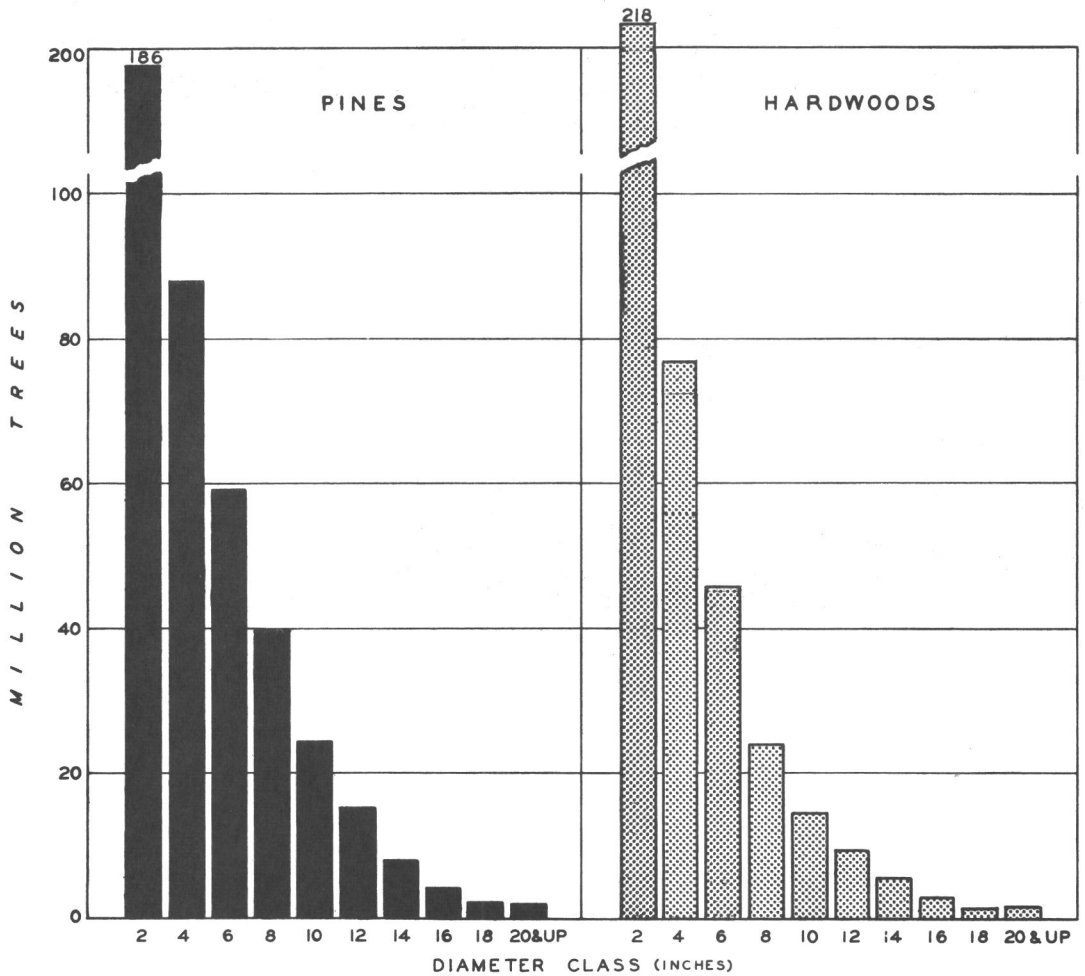


FIGURE 4.— STAND DIAGRAMS.

upon future industrial development and upon the practical attainment of successful forest management.

The results that can be expected from forest-management practices are indicated in figure 5, where the prevailing age-class and volume distribution of the pine and pine-hardwood types (excluding longleaf) are compared with the volumes per acre of better-stocked stands. The volume figures used are cubic feet inside bark, without deduction for woods cull. The age-class area and volume per acre of the prevailing forest were determined from field data gathered throughout the $2\frac{1}{2}$ million acres in the pine and pine-hardwood types, omitting the longleaf types. The per-acre volumes of the better-stocked stands are based upon the best stocked 10 percent of the uncut stands of weighted-average sites in these same types, and represent a yield from the forest land realizable under simple forest-management practices. With an abundant supply of young trees already on the ground, the chief requisite is a selective system of logging designed to increase the quality and quantity of the growing stock.

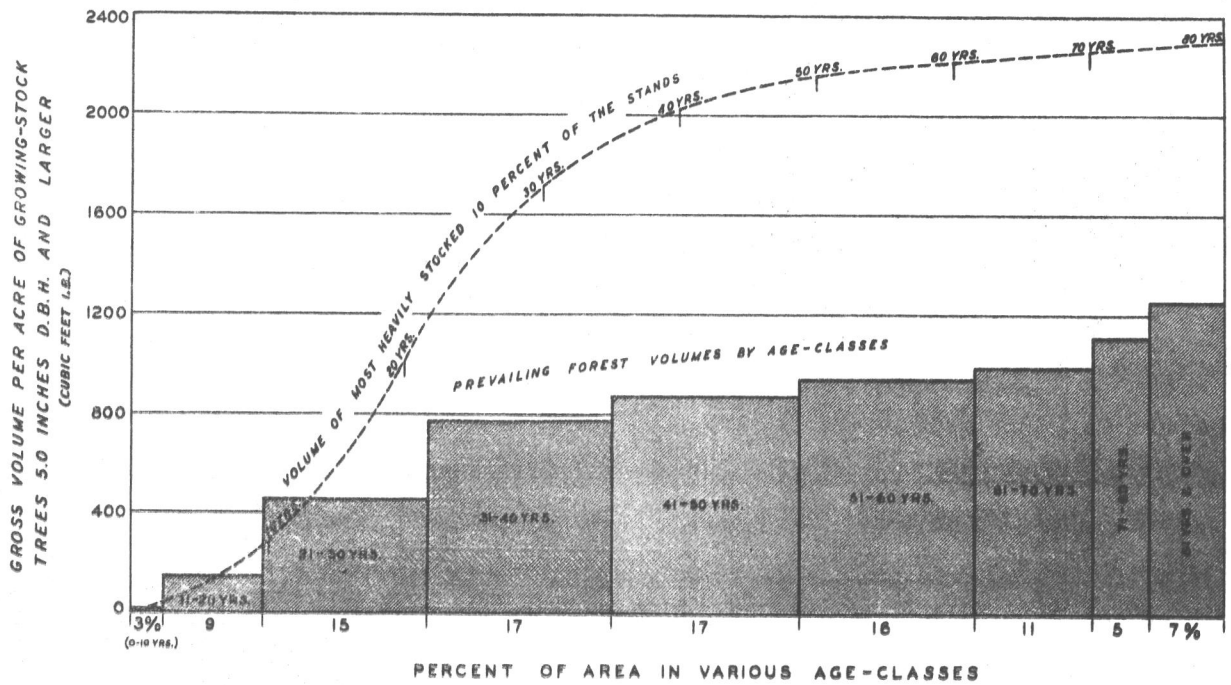


FIGURE 5.— PREVAILING VOLUMES, BY AGE-CLASSES, COMPARED WITH THOSE IN WELL-STOCKED STANDS (BASED ON PINE AND PINE-HARDWOOD TYPE-AREAS* OF 2,577,700 ACRES).

*EXCLUDING 550,300 ACRES IN THE LONGLEAF TYPES.

Fire protection is a fundamental part of any forest-management program. This is particularly true in the loblolly and shortleaf pine forests of this unit. At present intensive fire protection is limited to the Black Warrior and Talladega national forests, or to less than one-tenth of the forest land. Extensive county-wide protection, based upon patrol and volunteer assistance, is sponsored by the State and by Walker, Jefferson, and Shelby counties. The rest of the forest area has little protection. Organized unit-wide fire protection is imperative, if this important forested section is to produce the volume of wood products of which it is capable.

Volume Estimates

Board-foot volume

The estimate of the saw-timber[6] volume is given in table 7 and is expressed in the Doyle log scale, the Scribner log scale, and in lumber tally, which is based upon the International ¼-inch scale. The use of the Doyle scale is common throughout the South, but in the small timber characteristic of this unit it underestimates by about 40 percent the number of board feet of lumber that can be cut.

Table 7.—Net volume in Doyle and Scribner log scales, and in lumber tally, classified according to species group, 1936

Species group	Doyle	Scribner	Lumber tally
		Thousand board feet	
Pines:			
Loblolly pine	2,010,700	2,836,600	3,262,900
Shortleaf pine	958,900	1,543,400	1,854,200
Longleaf pine	709,000	1,024,100	1,190,400
Virginia pine[1]	190,600	295,000	349,500
Total pines	3,869,200	5,699,100	6,657,000
Hardwoods:			
Yellowpoplar	189,100	231,100	254,500
Redgum	138,500	182,300	203,400
Blackgum	64,600	84,700	93,900
Red maple, willow, sweet-bay, etc.	31,300	40,800	45,300
Red oaks	255,000	330,500	366,200
Forked-leaf white oak	112,000	141,100	155,400
Chestnut oak	52,200	64,000	70,200
Other white oaks	76,800	100,800	111,700
Hickories	183,300	242,500	268,700
Ash	12,700	16,000	17,600
Elms, beech, etc.	55,200	68,900	75,900
Total hardwoods	1,170,700	1,502,700	1,662,800
All species	5,039,900	7,201,800	8,319,800

1/ Includes other pines and cedar.

6/ See appendix for description of material included in saw timber.

Eighty percent of the net lumber-tally volume is in pines (table 8), chiefly loblolly, shortleaf, and longleaf. The volume in the hardwoods (20 percent of the total) is distributed among many species, yellowpoplar being the most abundant. As a group, however, the red oaks are most common, followed by the hickories. In the pines, 21 percent of the saw-timber volume is in old-growth stands, 74 percent in second-growth sawlog-size stands, and 5 percent in under-sawlog-size stands. Half the longleaf pine volume is in old-growth stands, while 87 percent of the loblolly pine and 84 percent of the shortleaf pine volume is in second growth. Thirty-five percent of the hardwood saw-timber volume is in the old-growth conditions, 57 percent in the second-growth sawlog-size, and 8 percent in the under-sawlog-size conditions. Among the hardwoods the chestnut oak group has the highest proportion of its volume in old-growth stands, and redgum has the highest proportion in second-growth stands.

Table 8.--Net volume, lumber tally, classified according to species group and forest condition, 1936

Species group	Old growth		Second growth			All forest conditions	Proportion of total
	Uncut	Partly cut	Sawlog size: Uncut	Sawlog size: Partly cut	Under sawlog size 1/		
	Thousand board feet						Percent
Pines:							
Loblolly pine	252,200	183,200	2,216,800	506,200	104,500	3,262,900	39.2
Shortleaf pine	153,300	144,000	1,158,800	275,200	122,900	1,854,200	22.3
Longleaf pine	313,900	286,200	375,000	135,300	80,000	1,190,400	14.3
Virginia pine 2/	48,800	28,000	212,600	44,300	15,800	349,500	4.2
Total pines	768,200	641,400	3,963,200	961,000	323,200	6,657,000	80.0
Hardwoods:							
Yellowpoplar	44,400	58,400	111,300	28,900	11,500	254,500	3.1
Redgum	16,300	21,500	105,700	49,400	10,500	203,400	2.4
Blackgum, red maple, etc.	14,100	27,000	66,400	20,100	11,600	139,200	1.6
Red oaks	56,800	62,100	153,200	62,400	31,700	366,200	4.4
Forked-leaf white oak	38,000	29,400	65,700	12,900	9,400	155,400	1.9
Chestnut oak and other white oaks	34,400	46,900	65,900	16,300	18,400	181,900	2.2
Hickories	37,800	59,100	93,200	41,800	36,800	268,700	3.3
Elms, ash, beech, etc.	26,400	16,500	35,600	12,600	2,400	93,500	1.1
Total hardwoods	268,200	320,900	697,000	244,400	132,300	1,662,800	20.0
All species	1,036,400	962,300	4,660,200	1,205,400	455,500	8,319,800	100.0
Percent of total	12.4	11.6	56.0	14.5	5.5	100.0	

1/ Includes areas classified as reproduction and clear-cut.
2/ Includes 9,300 M board feet of cedar and 49,200 M board feet of other pines.

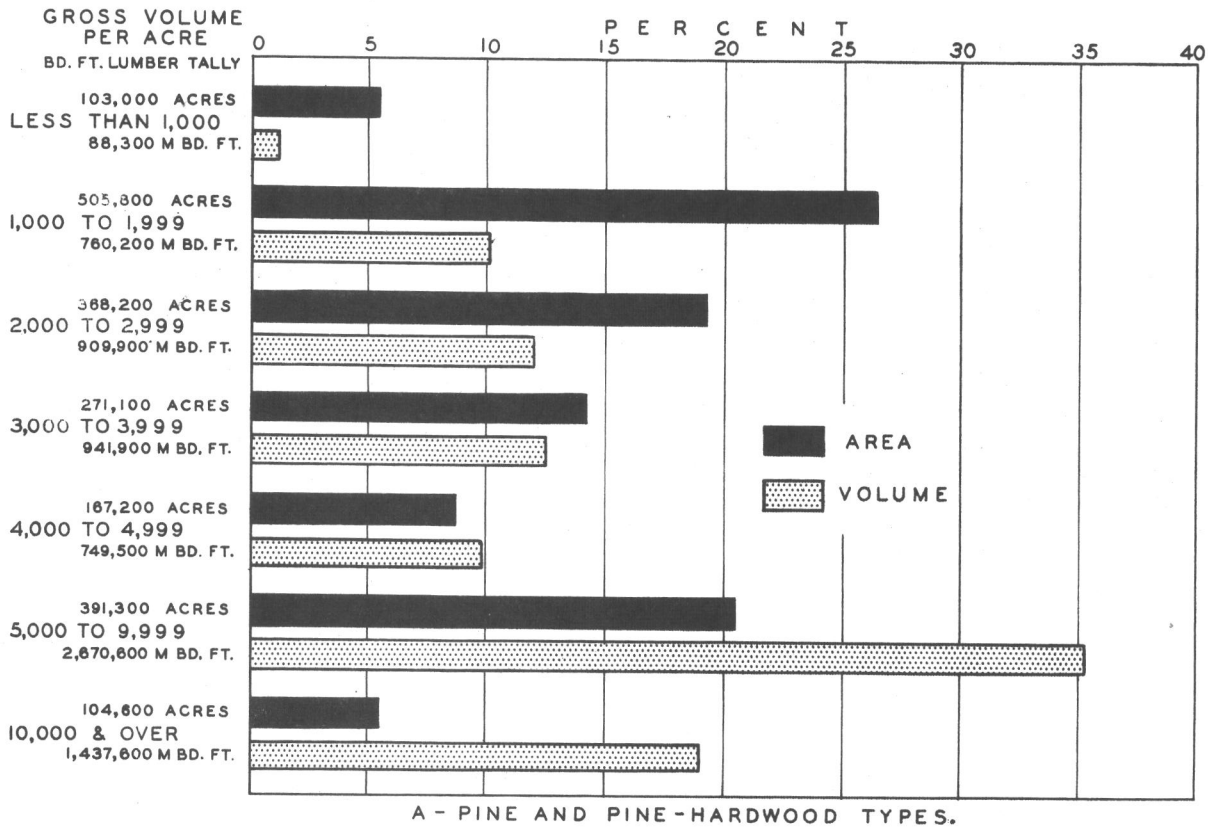
A large proportion of the board-foot volume is in the smaller trees (table 9). Three-fourths of the pine volume is in trees in the 10- to 16-inch diameter classes—48 percent of the pine volume in old-growth stands and 82 percent in second-growth stands. In the hardwoods, two-thirds of the volume is in 14- to 18-inch diameter classes—46 percent of the old-growth volume and 79 percent of the second-growth. Generally speaking, the volume of timber in the larger trees is not sufficient at present to support widespread, large-scale, sawmilling operations.

Table 9.—Diameter distribution of net volume, lumber tally, in the various forest conditions, 1936

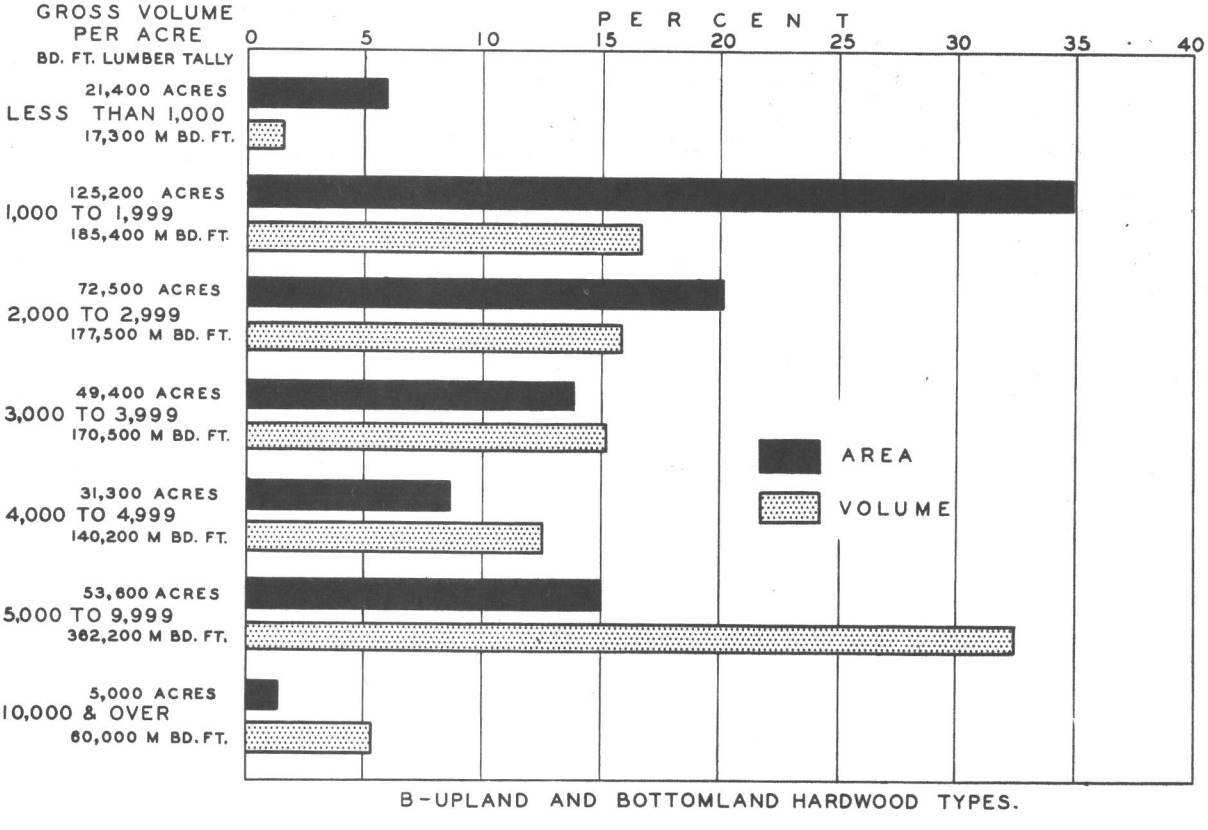
Species group and diameter class	Old growth		Second growth			All forest conditions	Proportion of species group
	Uncut	Partly cut	Sawlog size		Under sawlog size[1]		
			Uncut	Partly cut			
	Thousand board feet						Percent
Pines:							
10 - 12	127,000	134,200	1,805,400	499,000	264,400	2,830,000	42.5
14 - 16	225,400	183,900	1,374,800	306,500	47,100	2,137,700	32.1
18 - 20	183,100	154,900	578,900	124,800	8,800	1,050,500	15.8
22 and over	232,700	168,400	204,100	30,700	2,900	638,800	9.6
Total pines	768,200	641,400	3,963,200	961,000	323,200	6,657,000	100.0
Hardwoods:							
14 - 18	126,300	145,800	544,200	186,700	117,900	1,120,900	67.4
20 - 28	127,000	151,600	148,500	57,700	14,400	499,200	30.0
30 and over	14,900	23,500	4,300	-	-	42,700	2.6
Total hardwoods	268,200	320,900	697,000	244,400	132,300	1,662,800	100.0

1/ Includes areas classified as reproduction and clear-cut.

A large part of the saw-timber volume in the sawlog-size conditions is in stands of more than 2,000 board feet per acre. In figure 6, the proportion of the forest area supporting different volumes per acre is shown along with the proportion of the total volume in these volume-per-acre classes. All the volumes are gross, as no woods cull has been deducted. The pine and pine-hardwood types occupy 1,911,200 acres and contain 7.6 billion board feet gross volume. Almost 89 percent of the volume in these types is in stands of more than 2,000 board feet per acre. Only 32 percent of the pine saw-timber area is stocked with less than 2,000 board feet per acre, and only 5 percent has less than 1,000.



A - PINE AND PINE-HARDWOOD TYPES.



B - UPLAND AND BOTTOMLAND HARDWOOD TYPES.

FIGURE 6. — PROPORTIONAL AREA AND VOLUME OF THE SAWLOG - SIZE CONDITIONS, CLASSIFIED ACCORDING TO VOLUME OF SAW TIMBER PER ACRE.

The sawlog-size conditions of the upland and bottomland hardwood types occupy 358,400 acres and contain 1.1 billion board feet gross volume; 82 percent of the volume in these types is in stands of more than 2,000 board feet per acre. Forty-one percent of the area is stocked with less than 2,000 board feet per acre, but only 6 percent has less than 1,000.

The Survey roughly classified the pine saw-timber trees into three categories: "smooth," "limby," and "rough." This classification (table 10) brought out clearly the difference in quality between old-growth and second-growth timber. The older trees, with the exception of Virginia pine, are predominantly smooth and of high quality. Second growth, on the other hand, has a large proportion of limby and rough trees. Longleaf pine has the best quality second growth, followed by shortleaf. Two-thirds of the loblolly pine second growth, and almost all the Virginia pine, is in limby or rough trees.

Table 10.—Classification of pine according to saw-timber quality

Species and stand condition	Tree grade			Total
	Smooth	Limby	Rough	
	Percent of volume			
Loblolly pine:				
Old growth	98	2	-	100
Second growth	33	56	11	100
Shortleaf pine:				
Old growth	94	6	-	100
Second growth	60	33	7	100
Longleaf pine:				
Old growth	98	2	-	100
Second growth	72	26	2	100
Virginia pine:				
Old growth	40	60	-	100
Second growth	3	56	41	100

Cordwood volume

Although there is only a relatively small amount of large saw timber, the total volume of sound wood in all classes[7] of trees is enormous, as seen in table 11, where the cordwood volumes include the net volume in the entire stand of sound trees at least 5.0 inches d.b.h. outside bark, and also the net sound volume in cull trees 5.0 inches d.b.h. and larger. These volumes are expressed in terms of standard cords (4 x 4 x 8 feet), estimated to contain 90 cubic feet if pine or 80 cubic feet if hardwood, both including bark.

Slightly over half the total cordwood volume is pine. Nearly three-fifths of the pine volume is in the sawlog portion of sawlog-size trees. Young trees under saw-timber size contain nearly 7 million cords. Suitable for pulpwood, but at present largely unsalable, are the 3.4 million cords of pine in the upper stems of sawlog-size trees and in cull trees.

Table 11.—Net volume in various classes of sound material, expressed in cords, 1936

Species group	Sound trees, sawlog size		Sound trees under sawlog size	Cull trees	All classes of material	Proportion of total
	Sawlog material	Upper stems				
	Cords (bark included)					Percent
Pines	14,628,500	2,326,200	6,773,100	1,119,600	24,847,400	52.3
Hardwoods:						
Soft textured[1]	1,497,700	833,800	1,619,400	1,572,700	5,523,600	11.6
Firm textured[2]	2,907,300	1,641,200	6,855,400	5,718,900	17,122,800	36.1
Total hardwoods	4,405,000	2,475,000	8,474,800	7,291,600	22,646,400	47.7
All species	19,033,500	4,801,200	15,247,900	8,411,200	47,493,800	100.0
Percent of total	40.1	10.1	32.1	17.7	100.0	

1/ Yellowpoplar, redgum, blackgum, and tupelo, basswood, red maple, willow, sweetbay, etc.
2/ Oaks, hickories, ash, beech, birch, elms, dogwood, persimmon, and sycamore, at present are now used commercially for pulping in this section.

Forty-eight percent of the cordwood volume is in hardwoods. The soft-textured hardwoods, those species commercially pulped at present, make up one-fourth of the total hardwood volume. In these species there are 1.6 million cords of sound wood in cull trees that could be used as pulpwood. The firm-

7/ See appendix for description of various classes of cordwood material.

textured hardwoods are not used as a source of commercial pulping fibre at present, but recent tests at the Forest Products Laboratory at Madison, Wisconsin, indicate that satisfactory liner-board can be made from a species as poor as scrub oak. Experiments such as these will go far to increase the use of the firm-textured species for pulpwood and eventually may create a market for the low-grade material in these species now so abundant in this unit.

The cordwood volume of the sound-tree growing stock is shown in figure 7, classified according to species group and diameter class. In this figure the volume in cull trees, scrub oaks, and tops and limbs of sawlog-size hardwood trees is entirely excluded. Approximately 29 percent of the pine volume, 52 percent of the soft-textured hardwood volume, and 70 percent of the firm-textured hardwood volume, are in trees below sawlog size. Thinning of dense stands would be good silviculture in certain localities, but most of the small pines and soft-textured hardwoods should be left to augment the saw-timber growing stock. In the firm-textured hardwoods occurs the highest proportion of trees that will never grow into good saw timber, and it would be good management to remove them as soon as a market becomes available.

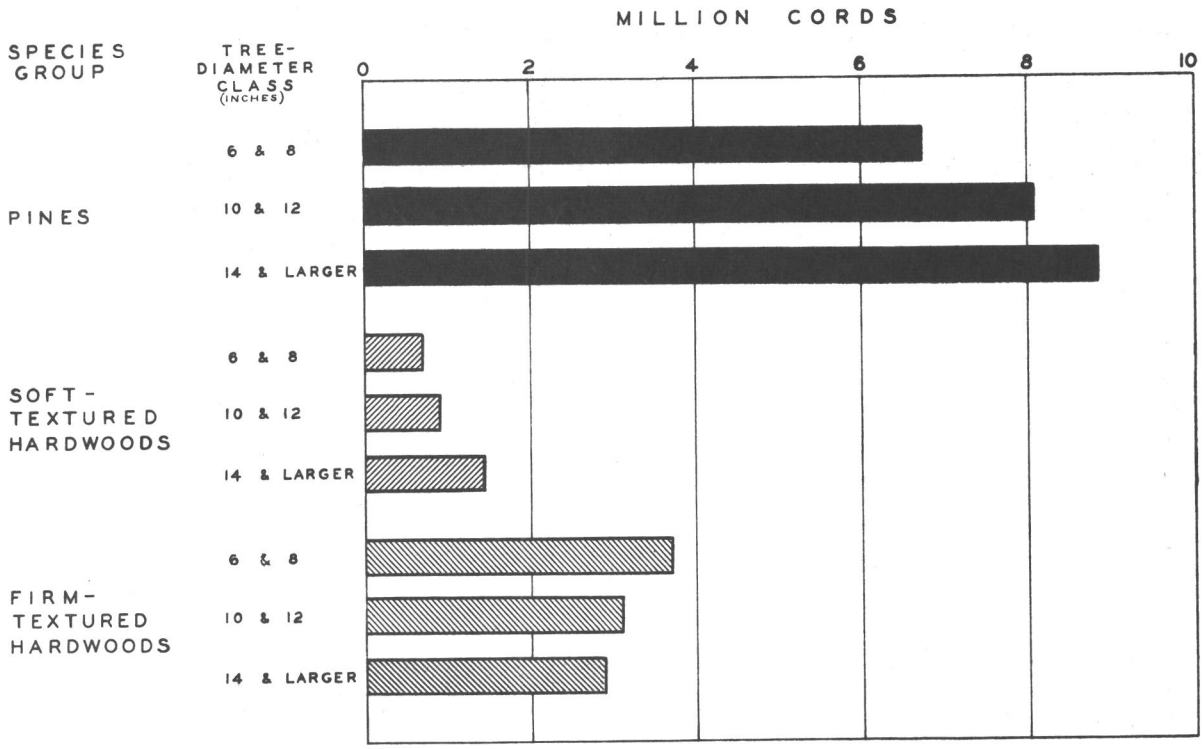


FIGURE 7.—CORDWOOD VOLUMES OF PINES AND HARDWOODS, BY SIZE CLASSES; SOUND TREES ONLY, 1936.

The average stand for the entire unit is 9.1 cords of sound trees per acre (table 12). The bottomland hardwood type group has the highest average volume per acre in most of the forest conditions, but the area in this type group is relatively small. Most important from the standpoint of area and volume is the second-growth sawlog-size uncut condition in the pine type group, which averages 15.3 cords per acre and occupies 890,500 acres of land; 37 percent of all the cordwood growing stock volume in sound trees in the unit is in this condition and type group.

Table 12.—Average volumes of cordwood per acre of growing stock by type groups and forest conditions, 1936

Type group	Old growth		Second growth			All forest conditions[1]
	Uncut	Partly cut	Sawlog size		Under sawlog size	
			Uncut	Partly cut		
	Cords (bark included)					
Pine	19.9	12.0	15.3	10.4	3.8	11.0
Pine-hardwood	15.2	11.9	13.0	10.1	3.8	7.4
Upland hardwood	13.7	10.3	11.0	8.7	3.8	6.2
Bottomland hardwood	18.4	17.8	18.3	12.0	5.5	11.6
All types (weighted average)	17.3	11.6	14.5	10.3	3.8	9.1

1/ Includes reproduction and clear-cut areas.

Poles and piles

The Survey classified the pine and cedar trees between 7.0 and 18.9 inches d.b.h. for their suitability as poles and piles, and found that about one in six, or over 15 million trees (table 13), would meet the pole and pile specifications of the American Standards Association. The volume of these trees also has been included in the previous volume estimates, since many of them will be used for lumber or other products. Sixty-four percent of the trees will yield pieces less than 30 feet long, 18 percent will make 30-foot poles or piles, and 18 percent will make poles or piles at least 35 feet long. The proportion of the trees suitable for the longer lengths in this unit is higher than the State average.

Table 13.—Total number of pine poles or piles, classified according to length and diameter, 1936

Tree-diameter class (inches)[1]	Pole or pile length (feet)						All lengths	Proportion of total
	20	25	30	35	40	45 or over		
	Thousand pieces							Percent
7.0 - 8.9	2,809	812	301	72	-	-	3,994	26.2
9.0 - 10.9	2,331	1,348	900	311	162	89	5,141	33.8
11.0 - 12.9	856	883	1,035	496	239	187	3,696	24.3
13.0 - 14.9	218	314	359	398	224	142	1,655	10.9
15.0 - 16.9	49	95	115	154	122	78	613	4.0
17.0 - 18.9	-	18	23	31	28	22	122	0.8
Total	6,263	3,470	2,733	1,462	775	518	15,221	100.0
Percent of total	41.1	22.8	18.0	9.6	5.1	3.4	100.0	

1/ Measured at breast height outside bark.

Forest Increment

"Forest increment" is the net volume of wood created by growth of the forest growing stock. In the tables dealing with forest increment, except table 16, the calculations for each year are based upon (1) the growth of the sound trees already of measurable size that remained in the stand; and (2) the volume of those trees that grew into measurable size; minus (3) the volume lost because of mortality, rot, and other natural causes. The board-foot increment includes the growth on the saw-timber portion of sawlog-size trees. The cordwood increment, which includes bark, is the growth on the sound stemwood of pines 5.0 inches d.b.h. and over, on under-sawlog-size hardwoods, and on the sawlog portion of sawlog-size hardwoods. Increment on cull trees and limbs of all species is omitted. Cubic-foot volumes are for wood without bark; otherwise the material is identical with that included in the cordwood tables.

The increment of the forest stands in 1936 is given in tables 14 and 15. This is the latest year for which increment was calculated by forest conditions, as the changes in the area of these conditions, due to cutting and growth, have not been determined since the inventory was made. The total increment of the pines and hardwoods in 1937 can be calculated, however, and these increment values are used in tables 20, 21, and 22 to compare the 1937 commodity drain with the increment.

In 1936 the total forest increment was 375.6 million board feet, of which 80 percent was in the pines and 20 percent in the hardwoods. Growth of trees just coming into the measurable sizes was responsible for 55 percent of the board-foot increment in the pines and 70 percent of that in the hardwoods. Ninety-four percent of the increment is in second-growth stands, and more than half is represented by trees in the minimum sawlog sizes, where logging costs are high and the yield of high-grade lumber is low. It is possible that the lumber industry will continue to be dominated by the small portable sawmills that use small timber and operate at little, if any, profit; but it may give way to the pulp and paper industry, which can use this small second-growth timber more advantageously. The lack of suitable timber may cause a reduction or migration of the sawmill industry and provide a temporary respite in which the trees can increase in number, size, and quality.

Table 14.—Net increment in board feet (lumber tally) and cubic feet in the various forest conditions, 1936

Forest condition	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet -			Thousand cubic feet (i.b.)		
Old growth	9,100	11,800	20,900	1,650	3,660	5,310
Second growth:						
Sawlog size	219,000	46,800	265,800	37,610	16,060	53,670
Under sawlog size	72,200	16,200	88,400	27,120	9,350	36,470
Reproduction and clear-cut	400	100	500	140	60	200
All forest conditions	300,700	74,900	375,600	66,520	29,130	95,650

The estimate of the net increment expressed in standard cords (4 x 4 x 8 feet) is given in table 15. The material included here is the same as that shown in cubic feet in table 14, except that bark is included.

Table 15.—Net increment in cords of wood with bark, classified according to forest condition, 1936

Forest condition	Pine	Hardwood	Total
		Cords	
Old growth	21,300	55,100	76,400
Second growth:			
Sawlog size	491,900	247,700	739,600
Under sawlog size	364,300	147,100	511,400
Reproduction and clear-cut	1,800	900	2,700
All forest conditions	879,300	450,800	1,330,100

An estimate of the average increment per acre in the various forest conditions in 1936 is presented in table 16. These values are based on the 1936 inventory and on the assumption that no trees were harvested during that year. The increment for the whole area averages only 96 board feet per acre; this is somewhat lower than the 118 board-foot average increment per acre in southwest Alabama but is higher than the 77 board feet per acre in the Tennessee Valley of Alabama. The increment in the second-growth sawlog-size uncut stands is indicative of the timber-producing ability of the soil and climate, but even in these stands the increment can be increased with proper management. An average annual yield per acre of at least 200 board feet, or 0.7 of a cord, is within the realm of possibility, if the entire forest area were under good management.

Table 16.—Average increment per acre in the various forest conditions, uninfluenced by cutting, 1936

Forest condition	Pine component			Hardwood component			Total per acre		
	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords	Bd.ft.	Cu.ft.	Cords
Old growth:									
Uncut	2	-.7	-.01	36	9.0	.14	38	8.3	.13
Partly cut	39	7.7	.10	21	7.7	.12	60	15.4	.22
Second growth:									
Sawlog size:									
Uncut	142	23.9	.31	27	9.6	.15	169	33.5	.46
Partly cut	79	15.0	.20	24	7.2	.11	103	22.2	.31
Under sawlog size	45	17.1	.23	10	5.9	.09	55	23.0	.32
Reproduction and clear-cut	2	.9	.01	1	.3	.01	3	1.2	.02
Weighted average	77	17.0	.23	19	7.3	.11	96	24.3	.34

Forest Industries

The lumber industry

Over 81 percent of the lumber is cut by small circular sawmills having a capacity of less than 20,000 board feet per day. In 1937 there were at least 636 of these mills, distributed throughout the unit (fig. 8). Approximately 20 percent of them are farm or neighborhood mills that produce lumber chiefly for local construction and repairs. The others are small commercial mills that sell their rough lumber to concentration yards. Many yards finance the mills, but one yard seldom controls more than 15, and a few yards operate their own small mills directly. There were about 80 concentration yards in the unit in 1937.

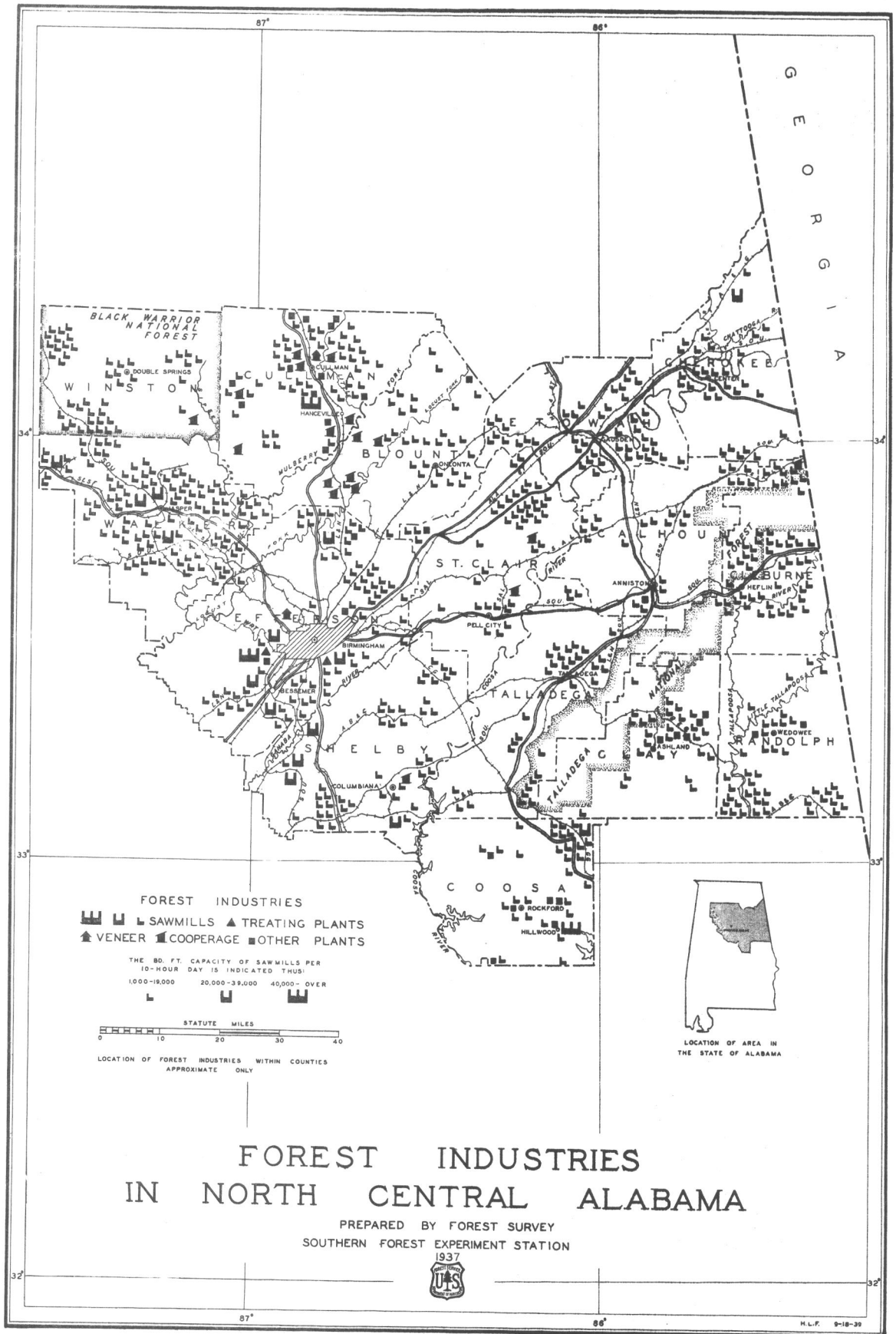
Fourteen percent of the lumber was produced by the 15 sawmills having a capacity of 20,000 to 39,000 board feet per day (table 17). Most of these mills have facilities for finishing and kiln-drying their lumber and are at least "semipermanent." Some buy logs delivered by truck to the mill, others log their own land, and a few log the lands of mining and land-holding companies. Most of their pine lumber is sold finished, but most of the hardwood is sold in rough form. Only 5 percent of the lumber was cut by the 3 pine sawmills with a capacity of more than 40,000 board feet per day. These mills are large stationary plants, well equipped to manufacture lumber of high quality.

Table 17.—Number of sawmills, lumber production, and extent of employment, classified according to size of mill, 1937

Rated capacity[1] in M bd. ft. per 10-hour day	Number of sawmills	Lumber production			Employment provided		
		Pine	Hardwood	Total	In woods[2]	In mill	Total
		- Thousand board feet - -			- Thousand man-days - -		
Under 20	636	290,100	9,100	299,200	346	624	970
20 to 39	15	43,400	6,100	49,500	60	107	167
40 to 79	3	16,700	200	16,900	41	46	87
All mills	654	350,200	15,400	365,600	447	777	1,224

1/ Rated capacity indicates size of mill rather than actual average daily production.
2/ Includes employment utilized in producing logs for sawmills outside the unit.

Ninety-six percent of the lumber was cut from the pines, and 4 percent from the hardwoods. Red and white oaks, yellowpoplar, redgum, hickory, and ash were the chief hardwood species utilized. All but 3 million board feet of the pine production was cut from forest stands within this unit, while less than 1 million board feet of hardwoods was brought in from outside sources. More saw timber was shipped out of the unit for manufacture than was brought into it, however, as nearly 12 million board feet of pine and 4 million of



FOREST INDUSTRIES IN NORTH CENTRAL ALABAMA

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1937

FIGURE 8.- FOREST INDUSTRIES MAP

hardwoods were taken in log form to sawmills in Alabama south and west of this unit.

The number of sawmills in the various counties is shown in figure 9. The shading indicates the total quantity of lumber produced by the mills in each county. Although the sawmills are fairly evenly distributed, those in Walker and Jefferson counties sawed 30 percent of all the lumber cut within the unit.

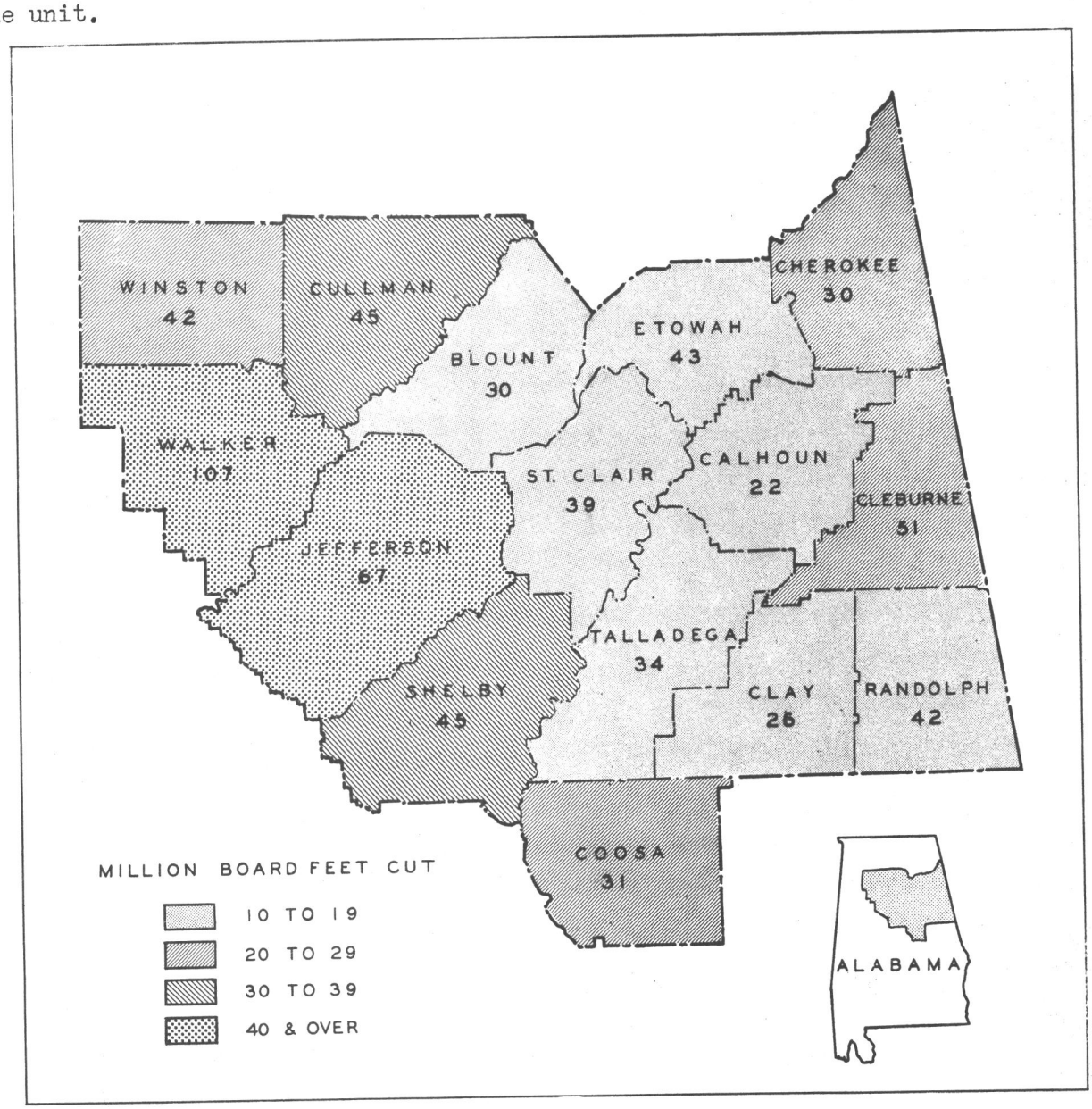


FIGURE 9.— LUMBER PRODUCTION BY COUNTIES DURING 1937 (INDICATED BY HATCHING), AND APPROXIMATE NUMBER OF SAWMILLS (SHOWN BY NUMERALS)

Other forest industries

In 1937 there were 18 cooperage plants operating within the unit (table 18). Twelve of these manufactured heading for slack cooperage, using pine and small amounts of redgum and yellowpoplar. Five of them made slack staves from pine and one made tight staves out of white oak. These plants used 57,300 cords of

pine and 1,900 cords of hardwood in 1937. Practically all this timber was cut within the unit.

Three small veneer plants were operating in 1937; they cut veneer and fabricated it into fruit, strawberry, and market baskets, and into strawberry crates, using redgum, blackgum, yellowpoplar, and pine. Only 200,000 board feet were used in 1937, all cut locally.

Table 18.—Wood-products production and employment, 1937

Industry or commodity	Number of plants	Cut in woods	Produced or used by plants	Thousand man-days of employment		
				In woods	In plants	Total
		--- M bd. ft. ---				
Lumber	654	377,900	365,600	447	777	1,224
Veneer	3	600	200	1	1	2
		--- M pieces ---				
Cross ties (hewn)	-	436	-	62	-	62
Poles and piles	-	101	-	16	-	16
Fence posts	-	1,555	-	23	-	23
		--- Cords ---				
Cooperage	18	62,100	59,200	62	82	144
Pulpwood	-	19,900	-	20	-	20
Fuel wood	-	518,800	-	716	-	716
Miscellaneous 1/	33	93,700	2/ 6,300	165	3/ 35	200
Total	708			1,512	895	2,407

1/ Includes 24 shingle mills, 1 handle plant, 2 excelsior mills, 3 shuttle block mills, 1 dimension and 2 treating plants.
2/ Amount of material treated by treating plants not included.
3/ Includes labor in treating plants.

In 1937 numerous other forest-industrial plants were utilizing the timber resource, including 24 small shingle mills, 1 handle plant, 2 excelsior plants, 3 shuttle block mills, 1 small dimension plant, and 2 treating plants. The shingle mills used pine and yellowpoplar; the excelsior mills used only pine; the shuttle-block mills required dogwood; and the treating plants processed poles, piles, posts, cross arms, cross ties, lumber, and mine timbers, largely pine. These small industries, exclusive of the treating plants, used 4,200 cords of pine and 2,100 cords of hardwood. All the pine came from this unit, but a few hundred cords of hardwood were brought in from nearby units in Alabama.

Likewise, a large quantity of material was cut in the woods and used locally without further refinement or shipped to manufacturing plants outside the unit. This included 436,000 hewn cross ties, 101,000 poles and piles, 89,000 cords of mine timbers, 1½ million fence posts, and about half a million cords of fuel wood. In addition, about 24,000 cords of cooperage stock, veneer blocks, and pulpwood were shipped to plants outside the unit.

The numerous wood-using activities provided employment for a great many individuals. It is impractical to determine the total number, but it is safe to say that a large majority of the 59,000 farm operators made some part of their living from working in the woods and forest-industrial plants. Moreover, there are several thousand other persons who earn the major part of their livelihood from this source. In 1937 the forest industries furnished 2,407,000 man-days of employment, distributed among many people in many mills and forest activities. Over half the employment was in the lumber industry, 30 percent in the production of fuel wood, and 6 percent in the cooperage industry; 63 percent was in the woods and 37 percent in the wood-using plants.

Commodity Drain

The commodity drain from the sound-tree growing stock includes both the utilized material and the sound usable material left in felled trees. The drain on the saw-timber portion of the trees, including both the utilized and wasted portions, is expressed in board feet, whereas the volumes given in cubic feet include drain on saw-timber material, upper stems of sawlog-size pines, and small trees ranging from 5.0 inches d.b.h. to sawlog size.

In 1937 about 529 million board feet of material was removed from the sound-tree growing stock to meet farm needs and those of the various wood-using industries (table 19). Ninety percent of this commodity drain was pine; the remainder was hardwood. Lumber accounted for 73 percent of

Table 19.—Commodity drain from sound-tree growing stock, 1937

Reason for drain	Saw-timber material			All material		
	Pine	Hardwood	Total	Pine	Hardwood	Total
	- Thousand board feet - -			- Thousand cubic feet - -		
Lumber	368,300	20,200	388,500	65,130	3,070	68,200
Cross ties (hewn)	14,200	13,600	27,800	2,530	2,190	4,720
Poles and piles	5,700	-	5,700	1,330	-	1,330
Veneer	-	600	600	-	100	100
Cooperage	24,800	1,400	26,200	5,250	230	5,480
Miscellaneous manufactures	9,200	2,400	11,600	5,470	1,570	7,040
Pulpwood	4,800	-	4,800	1,340	50	1,390
Fuel wood	38,500	12,800	51,300	13,690	7,090	20,780
Fence posts	300	900	1,200	90	470	560
Miscellaneous farm use and land clearing	8,900	2,300	11,200	2,950	1,490	4,440
Total[1/]	474,700	54,200	528,900	97,780	16,260	114,040

1/ Drain from growing stock in cords with bark: Pine, 1,281,800, hardwood, 233,200; total, 1,515,000.

the drain, and fuel wood, hewn cross ties, and cooperage, a large portion of the rest. More than 95 percent of the board-foot drain received its primary manufacturing within the unit or was used locally. The total of all material removed from the sound-tree growing stock was 114 million cubic feet, of which fuel wood accounted for 18 percent. On a cordwood basis, the total drain was over 1.5 million cords of pine and hardwoods.

Comparison of Increment and Drain

The inventory volume estimated by the Survey as of January 1, 1936 has been revised to allow for the effects of growth, mortality, and commodity drain during the year to obtain the net volume of growing stock on January 1, 1937. The similar procedure followed in tables 20, 21, and 22 leads to an estimate of the volume of growing stock as of January 1, 1938.

During 1937 the board-foot growing stock decreased by 154 million board feet, or 1.9 percent (table 20). This decrease is due to overcutting in the pines, where the commodity drain exceeded not only the net increment but the total growth. Fire protection and good forest-management practices will go far to reduce the large volume lost through mortality; but unless the present cut is reduced and an increased volume of growing stock is allowed to accumulate, progress will be extremely slow.

Table 20.—Balance between increment and drain of saw-timber material, 1937

Item	Pines	Hardwoods	Total
	Thousand board feet		
Net growing stock, Jan. 1, 1937	6,526,700	1,684,300	8,211,000
Growth, 1937	389,900	92,200	482,100
Mortality, 1937	90,100	17,300	107,400
Net increment, 1937	299,800	74,900	374,700
Commodity drain, 1937	474,700	54,200	528,900
Net change in growing stock, 1937	-174,900	+20,700	-154,200
Net growing stock, Jan. 1, 1938	6,351,800	1,705,000	8,056,800

A surplus of increment over commodity drain exists in the hardwoods. Discrimination in the use of the various hardwood species results in a concentration of the drain on the better individuals of such species as yellowpoplar, redgum, and red and white oaks. The increment shown, however, is that of all species and trees, regardless of quality, if they are sound, sawlog-size trees that contain material suitable at least for rough construction. Although the hardwoods show an excess of increment over drain, there is a likelihood that the more valuable species are being depleted faster than they are being replaced through growth, while the supply of the less valuable species is increasing.

The total sound-tree growing stock larger than 5.0 inches d.b.h. decreased almost 16 million cubic feet in 1937 (table 21). The pine growing stock was reduced 29 million cubic feet, whereas the hardwoods increased by 13 million cubic feet. Even with reductions in mortality through increased fire protection and better management the pine volume will continue to decrease, unless the existing use is temporarily curtailed. Although the hardwood volume is increasing, the effect is to stock the forest land with an even higher proportion of low-quality species. If the present trends are continued the forest resource will constantly dwindle in quantity and quality, leading to a reduction in forest industries and lowered income to the people.

Table 21.—Balance (in cubic feet) between increment and drain of saw-timber and cordwood material, 1937

Item	Pines	Hardwoods	Total
	Thousand cubic feet		
Net growing stock, Jan. 1, 1937	1,787,180	849,460	2,636,640
Growth, 1937	98,350	39,120	137,470
Mortality, 1937	29,620	9,560	39,180
Net increment, 1937	68,730	29,560	98,290
Commodity drain, 1937	97,780	16,260	114,040
Net change in growing stock, 1937	-29,050	+13,300	-15,750
Net growing stock, Jan. 1, 1938	1,758,130	862,760	2,620,890

A comparison of growth with mortality and commodity drain for 1937 is made in figure 10. Growth, which is the amount of new wood added to the growing stock, represents the amount by which the stands would increase each year if none of the trees died and if no commercial use were made of them. Mortality is a direct loss that can be reduced through fire protection and intensive management of the timber stands—practices that also will increase the volume of growth. Commodity drain, however, is one measure of the usefulness of the forest to man and within limits must continue. The deficit in the pine stands between growth on the one hand and mortality and commodity drain on the other must be eliminated if the forest industries are to remain, and the situation must be reversed if forest industries are to increase in importance in this unit.

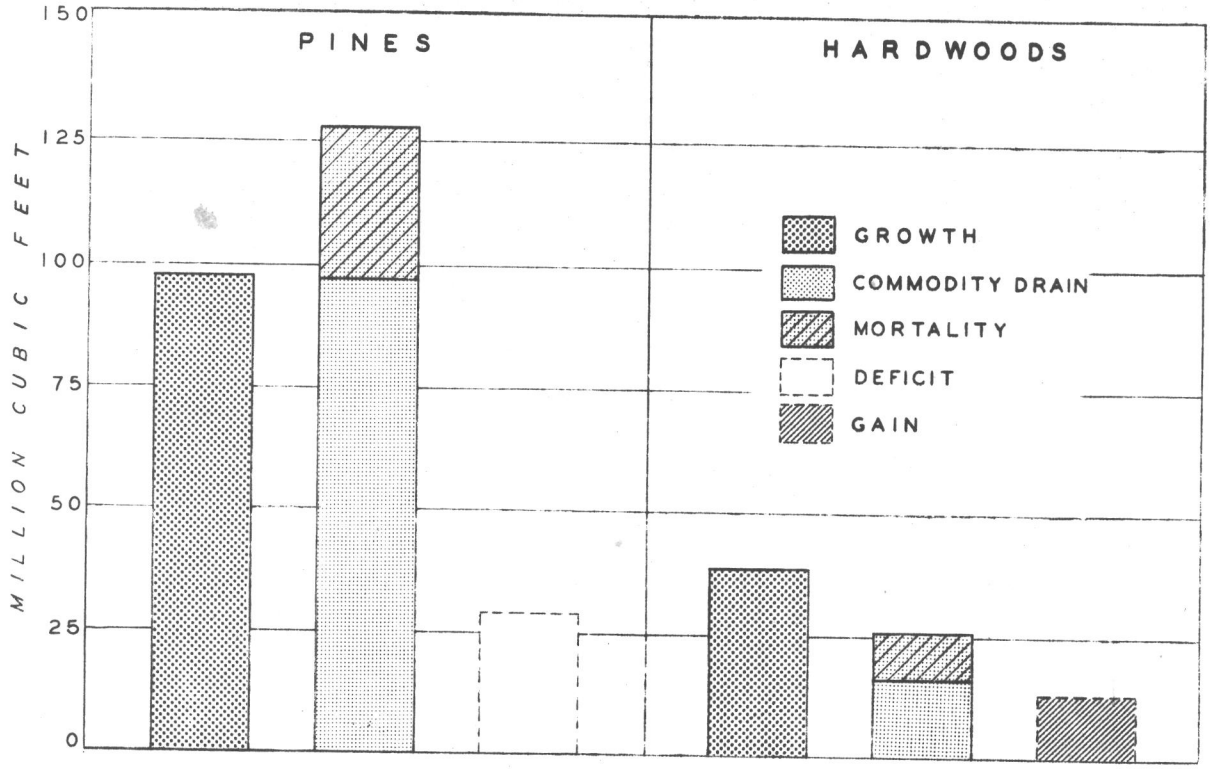


FIGURE 10.—COMPARISON OF GROWTH WITH MORTALITY AND COMMODITY DRAIN, 1937

A comparison of growth, mortality, and commodity drain is given in cords in table 22. The material included is the same as that shown in cubic feet in table 21 except that bark is included.

Table 22.—Balance (in cords) between increment and drain of saw-timber and cordwood material, 1937

Item	Pines	Hardwoods	Total
		Cords	
Net growth stock, Jan. 1, 1937	23,412,100	13,103,800	36,515,900
Growth, 1937	1,289,300	585,900	1,875,200
Mortality, 1937	388,000	147,500	535,500
Net increment, 1937	901,300	438,400	1,339,700
Commodity drain, 1937	1,281,800	233,200	1,515,000
Net change in growing stock, 1937	-380,500	+205,200	-175,300
Net growing stock, Jan. 1, 1938	23,031,600	13,309,000	36,340,600

Summary and Conclusions

North central Alabama is one of the most highly industrialized areas in the South. Vast deposits of coal, iron, and other minerals occur in close proximity to one another, and their development has made the Birmingham district world-famous as a coal, iron, and steel center. In addition, 48 textile mills are scattered throughout the area, yielding products valued at many millions of dollars annually and employing thousands of people. Outside of the industrial centers, however, it is a short step to the rural areas, where agriculture is the chief source of livelihood and thousands of farmers struggle to make a living from their cultivated crops, livestock, and forest products. Other rural dwellers engage full- or part-time in the forest industries, for here, as in most other parts of the South, forests occupy the major portion of the land; 4 of the 6.6 million acres in the unit are woodland. Forest lands, by their very abundance, should make a large and important contribution in renewable resources for the use of people and industry.

Nearly half of the land in farms is covered with forests, the management of which has an important bearing on the farm income. The majority of the farmers have not yet realized that their forested acres can be made to yield an annual crop of timber; and it is unfortunate that their principal technical advisers, including county agents, agricultural economists, and farm-management specialists, have all too often failed to appreciate the revenue-producing possibilities of the forest land. If forest practices on the farm forests of this unit are to be improved, foresters as a group first must secure the cooperation and support of those agricultural workers who most often come in contact with the farmers.

The coal and iron industries own many thousands of acres of land, a considerable part of which is forested. In the past, the surface use of this land has received little attention, but it is encouraging to find that this laissez-faire policy is gradually changing and that some of the larger companies are taking steps to manage their forest resource for continuous yields. The general adoption of forest-management practices by the mineral companies would greatly increase forest production in this area, with a corresponding increase in employment and industry.

The State and local governing bodies have not fully recognized the importance of the forest stands; at least the expenditures for fire control in Alabama are among the lowest in the South. In this unit, about 90 percent of the forest land is without intensive fire protection. What is needed is an annual State appropriation for fire control large enough to enable the State to meet its share of the cost of protection. In this unit, more of the individual counties should consider the establishment of a county-wide system, financed jointly by the county, State, and Federal governments and under the supervision of the State forestry organization. In the South increasing use is being made of the county-wide plan of fire control, which has the advantages of placing every acre of forest land in the county under protection and of distributing the cost equitably among more landowners.

Examples of organized management of forest land for sustained yields of forest products are difficult to find in this unit. A few of the larger companies are practicing minimum forestry measures, and probably some of the farm owners are cutting their woodlands with future crops in mind; but through-

out most of the forested area the stands are being cut with little regard for their continued productivity. As a result, there is a scarcity of the larger trees, from which better grades and more profit can be obtained; the stands are greatly understocked; revenues from forest lands are at a minimum; and the future of the wood-using industries is endangered. Landowners, wood-using industrialists, and the public should decide immediately whether they will continue to allow the forest resource to deteriorate and to decrease in importance or whether they will take steps to build it up to its maximum productivity.

At the outset it should be realized that increasing the forest production is a long process and one that requires enthusiasm, receptiveness, and concentrated effort on the part of all concerned. The need for increased production is evident: the commodity drain was 154 million board feet more than the increment in 1937! Since forest management means more jobs for more people, it should be encouraged, and the deficit obliterated by gradually increasing the forest increment. It should be possible to double the increment with (1) intensive fire protection; (2) an educational program to carry the best forestry practices to industrial and farm owners; and (3) the application of such good forestry measures as making improvement cuttings to remove trees that are defective and of poor form, thinning dense stands of young growth, utilizing trees of inferior species, and cutting conservatively to leave the forest growing stock in the best condition to produce a larger and more valuable crop in the future. These are minimum requirements, but their fulfillment would gradually reduce the overcut and in time would provide an increased volume of increment for the use of new industries.

New forest industries can be developed in this area when the sustained-yield capacity of the forest is increased and markets are developed. In a region where fuel is abundant and cheap; where water, rail, and highway transportation is available; where skilled workers are idle; and where raw material can be supplied at reasonable cost, there seems little justification for pessimism as to future forest industrial development. The forest resource can, and should, play a greater role in the rural and industrial organization of north central Alabama.

APPENDIX

Forest Type Groups

Pine.—Includes the following forest types: Longleaf pine, longleaf-other pine, loblolly pine, loblolly-other pine, shortleaf pine, shortleaf-other pine, Virginia pine, Virginia pine-other pine. About 87 percent of the net cubic volume is pine of various species (table 5).

Pine-hardwood.—Includes the following forest types: Longleaf-hardwood, loblolly-hardwood, shortleaf-hardwood, Virginia pine-hardwood, mixed hardwood-pine. About half the net cubic volume is pine.

Upland hardwood.—Includes the following forest types: Upland hardwoods, scrub hardwoods. Over 90 percent of the net cubic volume is mixed hardwoods; scattered pines account for the remainder.

Bottomland hardwood.—Includes the following forest types: Cypress-tupelo, bottomland hardwoods. About 50 percent of the net cubic volume is redgum, blackgum, tupelo, sweetbay, red maple, and other soft-textured hardwoods; the remainder is in species such as oaks, hickories, ash, beech, elms, and hackberry, with a small amount of loblolly pine.

Forest Conditions

Old-growth uncut.—Old-growth stands from which less than 10 percent of the volume has been cut.

Old-growth partly cut.—Old-growth stands from which 10 percent or more of the volume has been cut, but in which the remaining old-growth saw timber contains at least 1,000 board feet per acre of hardwood, or 600 board feet of pine or pine and hardwood mixed.

Second-growth sawlog-size uncut.—Second-growth stands from which less than 10 percent of the sawlog-size trees have been cut and in which the remaining saw timber contains at least 600 board feet per acre.

Second-growth sawlog-size partly cut.—Second-growth stands from which 10 percent or more of the sawlog-size trees have been cut, and in which the remaining saw timber contains at least 400 board feet per acre.

Second-growth under sawlog size.—Second-growth stands composed largely of under-sawlog-size trees, and containing less than 600 board feet per acre.

Reproduction.—Areas not falling into any of the other classifications, but bearing per acre more than 80 seedlings less than 1 inch d.b.h.

Clear-cut.—Cut-over areas in which an insufficient quantity of young growth has come in to classify them either as second growth or as reproduction.

Diameters

D.b.h. (diameter at breast height).—Diameter, outside of bark, $4\frac{1}{2}$ feet above the ground.

A 2-inch diameter class includes diameters 1 inch below and 0.9 inch above the stated midpoint, e.g., the 6-inch class includes trees 5.0 to 6.9 inches d.b.h. Corresponding limits apply to the other diameter classes.

Tree Classification

Sawlog-size tree.—A pine or cypress tree at least 9.0 inches d.b.h., or a hardwood tree at least 13.0 inches d.b.h., which will produce 1 sound butt log at least 12 feet long, or which contains at least 50 percent of its gross saw-timber volume in sound material in case the butt log is a cull.

Under-sawlog-size tree.—Any tree between 1.0 inch and the minimum merchantable diameter at breast height, at least 75 percent sound and with a reasonably straight stem. Only trees 5.0 inches d.b.h. and larger have been included in cordwood and cubic-foot estimates.

Cull tree.—A sound tree which, because of form, crook, extreme limbiness, or other sound defect, is not, and never will become, suitable for saw timber. Also a sawlog-size tree that is more than 50 percent defective, or an under-sawlog-size tree that is more than 25 percent defective.

Volume Estimates

Board-foot volume.—Only sawlog-size trees are included in this estimate. Top diameters vary with the limits of usable material, but no hardwood logs less than 8.5 inches in diameter at the small end, nor any pine logs less than 5.5 inches, are included. Deductions are made for woods cull, such as rot, fire scar, crook, limbiness, and similar defects, as well as for loss in sawing at the mill due to sweep and hidden defects. Board-foot volumes, based on the International $\frac{1}{4}$-inch rule, closely approximate the lumber tally of green boards in the mill. No deduction has been made for kiln, yard, and other losses before shipping.

Cordwood volume.—This includes the entire stand of sound trees at least 5.0 inches d.b.h., outside bark, and contains material from:

1. Sound trees sawlog size—the merchantable sawlog portion of saw-timber trees.

2. Upper stems of sawlog-size pine trees—the portion of saw-timber trees not used as sawlogs but usable as cordwood. This includes only the upper stems to a variable top-diameter (but not less than 4 inches).

3. Sound trees under sawlog size—the full stems of both pines and hardwoods at least 5.0 inches d.b.h. to a variable usable top-diameter (but not less than 4 inches).

Deduction is made for woods cull, such as rot, fire scar, excessive crook, bad knots, or other defects.

Additional material included in table 11 is the estimated sound usable portion of cull trees at least 5 inches d.b.h. and the upper stems and limbs of sawlog-size hardwoods and cypress.

Cubic-foot volume contains the material described under "Cordwood Volume." It includes no bark except in table 5.

Pine Tree Grades

Smooth tree.—A tree with at least 20 feet of clear length and at least 50 percent of the total usable length practically free of limbs and surface indication of knots.

Limby tree.—A tree with at least 12 feet of clear length and with 30 to 49 percent of the total usable length practically free of limbs and knots.

Rough tree.—A merchantable tree not clear enough to be put in either of the previous classes.